STANDARDS DEVELOPMENT BRANCH
3 6936 00000 2391

A REVIEW OF THE AVAILABILITY AND DEPENDABILITY OF PERSONAL PROTECTIVE EQUIPMENT FOR PESTICIDE USERS

1975

T
55.5
.P4
057
1975

Ontario
Ministry of the Environment

The Honourable
William G. Newman,
Minister

Everett Biggs,
Deputy Minister

Copyright Provisions and Restrictions on Copying:

This Ontario Ministry of the Environment work is protected by Crown copyright (unless otherwise indicated), which is held by the Queen's Printer for Ontario. It may be reproduced for non-commercial purposes if credit is given and Crown copyright is acknowledged.

It may not be reproduced, in all or in part, part, for any commercial purpose except under a licence from the Queen's Printer for Ontario.

For information on reproducing Government of Ontario works, please contact Service Ontario Publications at copyright@ontario.ca

T
55.5.P4
057
1975
c.2

A REVIEW

OF

THE AVAILABILITY AND DEPENDABILITY

OF

PERSONAL PROTECTIVE EQUIPMENT FOR PESTICIDE USERS

PREPARED FOR THE

ONTARIO MINISTRY OF THE ENVIRONMENT

BY

THE ONTARIO PESTICIDES ADVISORY COMMITTEE

MAY, 1975

PESTICIDES ADVISORY COMMITTEE

K. G. Laver, B.S.A.
Chairman

G. S. Cooper, B.A., B.Sc., M.Sc., Ph.D.
Vice Chairman

D. A. Chant, B.A., M.A., Ph.D., F.R.E.S.

C. D. Fowle, B.A., M.A., Ph.D.

R. Frank, B.Sc., M.S.A., Ph.D.

C. R. Harris, B.A., M.A., Ph.D.

J. C. Ingratta, B.S.A.

P. M. Lindley, B.S.A.

F. L. McEwen, B.Sc., M.Sc., Ph.D.

E. F. Muir, B.S.A.

G. R. Stephenson, B.Sc., M.Sc., Ph.D.

G. J. Stopps, M.B., B.S.

F. C. Taylor

K. B. Turner, B.Sc.F., M.Sc.F.

A. R. Chisholm, P.Ag.
Executive Secretary to the Committee

TABLE OF CONTENTS

	PAGE
ONTARIO PESTICIDES ADVISORY COMMITTEE	I
INTRODUCTION	IV
REPORT:	
(1) Main Suppliers	1
(2) Distribution	1
(3) Educational Programs	2
(4) Respiratory Protective Devices	3
a) Dust, Fume and Mist Respirators	5
b) Chemical Cartridge Respirators	5
c) Canister Gas Masks	6
d) Self-contained Breathing Apparatus	8
e) Supplied Air Respirators	10
Approved Standards	12
(5) Gas and Vapour Testing	16
Approved Standards	16
(6) Other Equipment	
a) Eye Protection	17
b) Footwear	17
c) Gloves	18
d) Other Clothing	18
REFERENCES	20
APPENDICES:	
i) Distribution outlets across Ontario	21 - 22
ii) The Effect of Facial Hair on Respirator Performance	23 - 24
iii) Outline for Selecting Respiratory Protective Devices	25
iv) Purity of Compressed Air for Breathing Purposes	26 - 27

.....Cont'd

PAGE

APPENDICES (Continued)

v) American National Standard for Identification of Air-purifying Respirator Canisters and Cartridges 28

vi) Approved Respiratory Devices for Protection against Pesticides 29 - 30

vii) Gas Detector Pumps and Gas Detector Tube Units Presently Available 31

viii) Glove Comparison Rating Chart 32

INTRODUCTION

The Pesticides Advisory Committee is concerned over the lack of reliable information relating to the availability and dependability of personal protective equipment for pesticide users and the need for effective educational programs dealing with this problem.

A Sub-Committee carried out a series of investigations into educational programs and the equipment designed to protect workers from the hazards of lethal and sublethal exposures, or from the accumulative effect of pesticides while handling and applying such toxicants. Particular emphasis was placed in the areas of respiratory protection, eye protection, foot-wear, gloves, clothing and gas or vapour detection devices.

This report details those investigations.

REPORT

1. MAIN SUPPLIERS

Many safety supply companies carry out business in Ontario providing a wide range of products from fire fighting equipment to safety pins. Some firms offer complete lines, other specialize. Only a limited number is geared to meet the needs and demands of pesticide producers, handlers and users.

The following companies responded to the Committee's request for information and participated in discussion with the Committee:-

American Optical Canada Safety Products (AOCO)

Industrial Safety Equipment Co. Ltd.

Levitt-Safety Ltd.

Mine Safety Appliances Co. of Canada Ltd. (MSA)

Safety House of Canada

Safety Supply Co. Ltd.

2. DISTRIBUTION

Each of the six companies interviewed have major distribution outlets in Toronto. Three have company-operated branches in other major cities across Ontario. (Appendix #1 - Distribution Outlets Across Ontario)

Distribution in rural or agricultural areas of Ontario is extremely limited. Certain pesticide companies carry chemical cartridge respirators as service items, as do a few farm supply dealers. The demand is limited and unpredictable. At the present time, none of the major supply houses caters directly to the agricultural community. However, some companies have indicated a willingness to make products available on a rush basis from their closest distribution centre.

It is understood that in the province of Saskatchewan the major supply companies do cater directly to agriculture through the wheat pools and other agro-business outlets. Such a service is backed up by educational programs geared to meet the farmers' needs.

3. EDUCATIONAL PROGRAMS

Promotion of personal safety equipment through seminars, training courses, trade shows, and catalogues is pursued with vigour in the mining, utility, construction, manufacturing, commercial, and municipal fields.

Dissemination of information to agricultural users of pesticides is limited to safety precautions outlined in Ontario Government publications pertaining to pesticide and fertilizer recommendations and to chemical industry literature and product labels. Displays of safety equipment at farm and related shows have been featured from time to time. At such times keen interest was shown by prospective users but due to lack of technical knowledge or the imparting of incorrect information by industry personnel on specific items, e.g. suitability of chemical cartridge respirators or canister gas masks as correct protection against named compounds, acceptance of such items remains grossly deficient.

4. RESPIRATORY PROTECTIVE DEVICES

The quality of face masks is generally high, but all may leak. A major problem has been the designing of a mask that will fit all shapes and sizes of heads and faces. In this connection the development of a range of sizes for both full face and oral-nasal masks is expected to receive encouragement in the United States by the National Institute for Occupational Safety and Health (NIOSH). (See Approved Standards, page 12)

Positive pressure masks have been available for at least twenty years and are standard on self-contained apparatus and supplied air respirators.

Future trends include battery-powered respirators certified by NIOSH. It is anticipated that the first models will be designed for protection against particulate matter.

It should be noted that, regardless of design, masks cannot be worn securely by people wearing beards, whiskers, side burns, moustaches and long hair. (Appendix #2 - The Effect of Facial Hair on Respirator Performance)

It should be further noted that the interchange of various makes of component parts belonging to NIOSH certified devices renders such certification void, for example if a canister produced by company A is installed on a face mask produced by Company B, the resulting device is not NIOSH certified.

NIOSH certified respiratory equipment is defined and coded as follows:-

Type of Device	Coding
a) Dust, Fume and Mist Respirators	TC - 21 - C
b) Chemical Cartridge Respirators	TC - 23 - C
c) Canister Gas Masks	TC - 14 - G
d) Self-contained Breathing Apparatus	TC - 13 - F
e) Supplied Air Respirators	TC - 19 - C

(Appendix #3 - Outline for Selecting Respiratory Protective Devices)

The majority of such devices available in Canada are produced by American companies. Therefore, it is important to associate the Canadian distributors with the U.S.A. producers as follows:-

U.S.A. Producers	Canadian Distributors
American Optical Corp. Safety Products Div.	AOCO Limited, Safety Products Div. Belleville, Ontario
Glendale Optical	Safety House of Canada, Weston, Ontario
Globe Safety Products Inc.	Safety House of Canada Weston, Ontario
Mine Safety Appliances Co.	Mine Safety Appliances Co. of Canada Ltd. Downsview, Ontario
Scott Aviation, Division of ATO, Inc.	Safety Supply Co. Ltd. Toronto, Ontario
SurviAir, Division of U.S. Divers Co.	Levitt-Safety Ltd. Toronto, Ontario
Welsh Manufacturing Co.	Levitt-Safety Ltd. Toronto, Ontario
Willson Products Div. E.S.B. Inc.	Safety Supply Co. Ltd. Toronto, Ontario
3M Company, Occupational Health and Safety Products Div.	Safety Supply Co. Ltd. Toronto, Ontario

a) DUST, FUME AND MIST RESPIRATORS - TC - 21- C

Primarily used for protection against particulates having a Threshold Limit Valve (TLV) of not less than 0.05 mg per cubic metre or 2 million particles per cubic foot, such respirators can protect the lungs from dusts generated through the handling of non-toxic materials such as flour and cement, etc.

b) CHEMICAL CARTRIDGE RESPIRATORS TC - 23 - C

Used widely by agriculturalists, chemical cartridge respirators will provide protection against organic vapours in concentrations not exceeding 1,000 ppm (0.1% by volume). Dual cartridge respirators are preferred to single cartridge respirators. A wide assortment of cartridges is available but not all are suitable for pesticide work. Company catalogues do list specific cartridges for pesticide work, but the availability of charts listing named pesticides, against which these cartridges will provide protection, is limited. Thus, the likelihood of selecting and using the wrong cartridge at the present time is a distinct danger and possibility.

There exists a definite need for accurate and reliable charts indexing suitability of specific cartridges used by agriculturalists. Acceptance of the NIOSH approval and certification scheme will do much to assure the user of correct selection and protection. (See Pages 12-15)

Chemical Cartridge Respirators are non-emergency protective devices and should never be used in immediately dangerous atmospheres except for escape purposes; designed to fit around the nose and mouth they provide no ocular protection.

Guidelines on the operational life and performances of cartridges and filters are described in generalities. For example, filters should be changed each day while in use, and cartridges should

be replaced when chemical odour becomes apparent. The face seal should be checked while the respirator is on the wearer's face, in accordance with the manufacturer's instructions appearing on NIOSH approved respirator cartons, or in instructional and operational literature contained therein.

c) CANISTER GAS MASKS TC - 14 - G

Canister gas masks have been used effectively for many years for respiratory protection against certain gases, vapours and particulate matter which otherwise might be harmful to life or health. They provide simplicity of operation, compactness, ease of maintenance and economy. However, because canister gas masks are air purifying devices, designed solely to remove specific contaminants from the air, it is essential that their use be restricted to atmospheres which contain sufficient oxygen to support life (at least 19.5 per cent by volume at sea level). It is imperative that the user assess the exposure conditions carefully before selecting a specific mask for respiratory protection. It is recommended that instruments be used, where practicable, in any situtation to measure the concentration of oxygen and harmful gases and vapours present in the atmosphere under the various exposure and operating conditions. If the specific exposure concentrations are suspected of exceeding the specific limitations, only a self-contained breathing apparatus or a supplied air respirator should be used.

From a practical standpoint, canister gas masks are generally suitable for ventilated areas not subject to rapid change, but should never be used in confined spaces below or above ground where oxygen deficiency and high gas concentrations may occur.

In examining industry catalogues and in discussion with industry representatives, it was apparent that the selection of a correct canister for pesticide work is very exacting. In the past a

colour coding system was utilized for many years, but variations existed between companies creating considerable confusion in selecting the correct canister. The problem was further compounded if replacement canisters were purchased from more than one source, a likely occurrence in the agricultural markets. In addition, while the screw threads which connect the canisters to the spiral breathing hoses varied slightly, union between the two could be obtained. The question arises as to the air-tightness of such a union.

Of considerable significance is the recent requirement by the National Institute for Occupational Safety and Health (NIOSH) that the colour coding for identification of air-purifying respirator canisters and cartridges, developed by the American National Standards Institute (ANSI), be adopted by all manufacturers of air-purifying devices. This requirement is dealt with in more detail under Approved Standards. (Page 15)

A major danger surrounding canisters is the operational life of such components, particularly if used by more than one person. The shelf life is date stamped on all canisters (usually three years with the protective seal unbroken), but the operational life of a canister can vary from several minutes to several hours and may depend on the following factors:-

1. The design, including the quality and amount of chemical fill, packing uniformity and density.

2. Variable exposure conditions, including concentrations of contaminants in the air, breathing rate of the wearer, temperature and humidity. Generally, higher concentrations, breathing rates and humidity conditions adversely affect service life. Since the exposure conditions

are subject to wide variation, it is most difficult to estimate the service life of a gas mask canister.

Subject to the proper donning and checking procedures a canister should be discarded when any of the following conditions prevail:-

a) Detection of the first trace of the contaminant.

b) Detection of any increase resistance to inhalation which indicates excessive moisture uptake by the canister.

c) If lens fogging occurs and fails to clean on inhalation.

d) The expiry date is past or when a colour match takes place in a window indicator type canister.

The construction of face mask components is generally of high quality. Weakness in the structure can develop over a period of time. Regular cleaning and inspection is therefore important. Particular emphasis should be placed on hose clamps and on the lens clamps surrounding the visor.

Some companies produce more than one size of mask. Care should be taken in selecting a mask with a comfortable, correct facial seal. Masks are designed to fit 85 per cent of all face sizes and shapes.

d) SELF-CONTAINED BREATHING APPARATUS TC -13 - F

Self-contained breathing apparatus is divided into three basic types - demand, oxygen-cylinder rebreathing, and self-generating.

Demand-type apparatus consists of a high-pressure cylinder, a demand regulator, a pressure gauge, and a face piece and tube assembly with exhalation valves. The air flow is automatically

regulated to meet the inhalation demands of the wearer and will fluctuate according to the rate of breathing. Unlike rebreathing apparatus, exhaled air is released into the atmosphere. The pressure gauge is used to indicate the air supply remaining in the cylinder, and a self-actuating warning device is also mandatory under NIOSH regulations.

Oxygen-cylinder rebreathing apparatus consists of a small cylinder of compressed oxygen, reducing and regulating valves, breathing bag, face-piece, and a chemical container to remove carbon dioxide from the exhaled breath.

The reducing and regulating valves reduce in pressure the high-pressure oxygen to a breathing level and exhaled breath is recycled following the removal of carbon dioxide.

Self-generating apparatus differs from demand and rebreathing-type apparatus in that it utilizes a chemical canister which evolves oxygen and removes the exhaled carbon dioxide in accordance with breathing requirements. No cylinder and regulating valves are required.

All the above equipment is mounted on the body. Some masks contain integral speaking diaphrams which permit audible communication between wearers. All self-contained breathing apparatus is designed for emergency use in hostile atmospheres and while it may be used on

a regular basis, economics dictate the use of equipment designed to provide similar protection on a more practical basis.

Training in the proper use, maintenance, and limitations of self-contained breathing units is essential.

Manufacturers and Canadian Distributors of Self-contained Breathing Apparatus

Manufacturer	Trade Name	Canadian Distributor
Scott Aviation	Scott Air-Pak	Safety Supply Co.
SurvivAir	SurvivAir	Levitt-Safety Ltd.
Mine Safety Appliances Co.	M.S.A.	M.S.A. Canada
Globe Safety Products Inc.	Globe Guardsman	Safety House of Canada

e) SUPPLIED AIR RESPIRATORS TC - 19 - C

Supplied air respirators will provide protection for extended periods. They should, however, be used only in atmospheres not immediately harmful to health or to life, or from which the wearer can escape without the use of the respirator. While various lengths of hose may be utilized, the maximum length should not exceed 300 feet (determined by NIOSH), thereby limiting the wearer to a fixed distance from the air supply source.

It should be noted that there are now available combination air line respirators and egress bottles which permit entry and working in hostile atmospheres.

There are three basic types of airline or supplied air respirators:

Continuous flow - This type relies on an air supply that meets Canadian Standards Association (CSA) standard Z 180.1-1973. (Appendix #4 - Purity of Compressed Air for Breathing Purposes)

Demand Air Line Respirators - Similar in principal to the self-contained demand units, air line demand units rely on compressed air cylinders that again contain air that meets standard Z 180.1-1973 of the CSA. Air-flow is delivered only during inhalation and will fluctuate according to the breathing demand.

Pressure Demand Air Line Respirators - Such units provide a positive pressure during both inhalation and exhalation and must meet the same requirements for demand systems except that the static pressure in the facepiece shall not exceed 1.5 inches of water, the exhalation resistance at 85 litres per minute shall not exceed the static pressure in the facepiece by more than 2.0 inches of water and that there be at least 4 CFM air flow during inhalation before a negative pressure is developed in the facepiece.

APPROVED STANDARDS

Canadian Standards

The Regulation made under the Ontario Pesticides Act, 1973 stipulates that, under certain circumstances, gas mask or self-contained breathing apparatus must be worn or immediately available. (Reference - Page 20) Yet, nowhere in Canada have standards been established stipulating minimum requirements. U.S.A. approvals are accepted and used in Canada. Little criticism can be levelled at this approach as the majority of personal protective equipment sold and used in Canada is manufactured in the United States and must meet NIOSH standards in that country, prior to marketing. Exceptions include such companies as Dragerwerk, A.G., Postfach (Germany), and Siebe Gorman Ltd., (Chessington, Surrey, England), whose products are presently approved by the U.S. Bureau of Mines (now NIOSH) and sold in the United States.

The greatest problem in Ontario surrounding the acceptance of U.S. approval was the continuing difficulty of obtaining accurate and detailed information on criteria adopted by the U.S.A. and the additional difficulty of acquiring up-to-date lists of approved devices.

NIOSH Approval

The following information is quoted from the U.S. Department of Health, Education and Welfare publication No. (NIOSH) 75-119, dated July 1974:-

> "Approval or certification of personal protective devices and industrial hazard measuring instruments, performed at this time by the National Institute for Occupational Safety and Health, is based on the regulations developed for respiratory protective devices by the U.S.Department of the Interior, Bureau of Mines. From 1919 to 1973, the Bureau

performed tests and issued approvals in respirators for coal mine use, from its Pittsburg, P.A. laboratories. On March 25, 1972, in accordance with the Federal Coal Mine Health and Safety Act of 1969, the Bureau and NIOSH issued a joint regulation for respirator approval in the Federal Register (37 FR 11458), when the Bureau officially transferred testing of these devices to NIOSH testing and certification laboratory at Morgantown, W.Va. Regulations for respirator approval are incorporated in the Code of Federal Regulations as Title 20 CFR, Part 11. Approvals under these Regulations are issued jointly by the Bureau and NIOSH. Respirators included in lists appearing in the publication were all issued under the most recent regulations, described as Part 11. Respirator approvals issued by the Bureau under older regulations are scheduled to expire on the dates listed. After the expiration dates, users should purchase only devices approved under Part 11 and manufactured under strict quality control requirements, although they may continue to use Bureau-approved respirators until the terminal approval dates which were established by the Bureau and NIOSH to permit orderly replacement with new devices.

Expiration of Bureau of Mines Respirator Approvals

The expiration dates for Bureau of Mines respirator approvals and the terminal approval dates for Bureau

of Mines-approved respirators already purchased by the user, was announced through publication in the Federal Register on April 9, 1974 (39 FR 12864).

The approvals were extended until September 30, 1974; a further extension until March 31, 1975 was granted on those respirators for which the manufacturer obtains approval of a quality control plan meeting the requirements of 30 CFR, Part 11. After March 31,1975, only respirators approved under Part 11 will be approved for use in hazardous atmospheres.

Already purchased Bureau of Mines-approved respirators will be approved for use until the following dates, unless they are upgraded to meet the requirements of 30 CFR, Part 11 and are relabelled:-

Self-contained breathing apparatus	.....March 31, 1979
Gas Masks	.....March 31, 1977
Supplied-air respirators	.....March 31, 1980
Dust, fume, and mist respirators	.....March 31, 1976
Chemical-cartridge respirators	.....March 31, 1976"

Manufacturers of equipment will be abiding by these dates. Some companies are developing conversion kits which will also require approval. It should be stressed, however, that component parts for old equipment may no longer be available following the expiry dates. Users are, therefore, urged to purchase newly approved apparatus for which replacement parts will be available.

In correspondence with the U.S. Department of Health, Education and Welfare, it was learned that recommended maximum use concentrations for the various types of air-purifying and atmosphere

supplying respirators is being developed and compiled by the American Conference of Government Industrial Hygienists Respirator Committee and the American Industrial Hygiene Association. This source of guidance is referred to by NIOSH in its examination of respiratory devices.

This guide presently recommends the use of chemical-cartridge respirators up to ten times the pesticide TLV concentration, gas masks and demand-type supplied-air respirators up to 100 times the pesticide TLV concentration. Above 1,000 X TLV, positive pressure self-contained breathing apparatus should be used.

NIOSH is presently evaluating the performance of respirator canisters and cartridges against the more highly-volatile pesticides.

All NIOSH approved equipment will be assigned a number prefixed by the letters TC, e.g., TC-23C-45. The absence of such coding will indicate that the equipment in question is not approved.

Colour Coding

The American National Standards Institute, Incorporated is charged with the responsibility of developing a colour coding standard for the identification of air-purifying respirator canisters and cartridges. The purpose of such a standard is to facilitate the accurate and rapid identification of such equipment by means of colour.

In the Institute's publication ANSI K13.1-1973, dated February 21 ,1973, is listed the colours assigned to a range of canisters and cartridges relative to their function. This table is reproduced with the permission of the American National Standards Institute, Inc. (Appendix 5)

5. GAS AND VAPOUR TESTING

Gas testing tube units provide a quick method of approximating concentrations of toxic gases and vapours in the ambient air.

Each unit consists of a manually-operated aspirating pump which draws a fixed volume and rate of air through a tube containing a chemically-impregnated packing. The concentration of the contaminant in the air is indicated in the tube by means of a chemically-produced colour change, the length of which is proportional to the concentration of the gas or vapour being measured. Readings should be recorded immediately after sampling as the colour change may fade quite quickly. Only one reading can be taken per tube.

Several makes of detector-pumps are available. They may be bellow-type or multi-stroke piston and all can be operated by hand. Tubes are not interchangeable.

Manufacturers and Canadian distributors of gas-detector tube units suitable for measuring concentration of methyl bromide, hydrocyanic acid gas (HCN), and phosphine

Manufacturer	Make	Type	Canadian Distributor
Dragerverk	Drager	Bellows	Safety Supply Co.
Gastec	Gastec	Piston	Levitt-Safety Ltd.
Kitagawa	Kitagawa	Piston	Matheson of Canada Ltd., Whitby, Ont.
Mine Safety Appliance Co.	M.S.A.	Piston	M.S.A. Canada

Approved Standards

Gas-detector tube units are being examined and approved by N.I.O.S.H. To date approvals have been issued only in respect to detector tubes for carbon monoxide, ozone, nitrogen dioxide, sulfur dioxide, hydrogen sulfide, carbon dioxide, ammonia, chlorine, trichloroethylene, carbon tetrachloride, perchloroethylene, and benzene. Certification of

tubes for methyl bromide, hydrocyanic acid gas, and phosphine is not yet scheduled. In this connection a chart listing various makes of gas-detector tubes is shown under Appendix # 7. This chart is provided for information only and should not be construed as an endorsement of the tubes listed.

6. OTHER EQUIPMENT

While the selection and wearing of respiratory protective equipment is of prime importance in the application of many toxic and hazardous pesticides, the Committee is also concerned over ocular injury and the danger of dermal intoxication.

The wearing of proper eye shields, foot-wear, gloves and protective clothing should be encouraged through educational programs.

a) Eye Protection

Eye protection is necessary and recommended when a full face mask is not worn.

Protective goggles are available from all major safety supply companies. Many are chemical resistant, some have specially treated lenses to reduce fogging, others have anti-fogging ventilation.

Prescription type safety spectacles are also available to which side shields can be attached, when necessary.

b) Foot-wear

The Ontario Pesticides Act, 1973 and Regulation 618/74 S.100 (2)(b) and 102 (2)(c) requires that a wholesale vendor and a retail vendor who stores any schedule 1, 2 and 5 pesticide have readily available, for emergency purposes, certain items of protective clothing, including rubber boots.

The term "rubber boot" is perhaps somewhat misleading as rubber may not withstand exposure to acid and solvent spills. Neoprene is considered much superior in this regard. It is suggested that the most suitable boot is one that is knee-length, acid and solvent resistant, and cleated or ribbed to prevent slippage. Such boots are available from many of the safety supply companies, a few of which deal only in foot-wear.

c) Gloves

Non-absorbing gloves should be worn at all times while handling, mixing, and applying pesticides.

Rubber gloves are specifically referred to in Section 100 (2) (b) and 102 (2) (c) of Regulation 618/74 under the Pesticides Act, 1973. Neoprene has been found superior to rubber in resisting the absorbtive penetration of many substances associated with pesticides. (Appendix # 8 - Glove Comparison Rating Chart.)

Other factors to be considered in selecting suitable gloves include sense of touch, wet grip, cut resistance, and abrasion resistance. Gloves should fit snugly. Fabric wrist gloves should not be considered.

Supplies of suitable gloves are available from most major supply companies.

(d) Other Clothing

A major concern in agricultural pesticide spraying is the unwillingness of the applicator to wear some form of protective clothing, particularly under warm summer conditions. At the very least, coveralls should be worn along with gloves and a hat to minimize the hazard of dermally toxic pesticides. The clothing should be changed and washed regularly following spraying.

Disposable garments suitable for pesticide work are now available. Made of "Tyvek" polyethylene fibres, such clothing will provide protection against dermal exposure resulting from pesticide drift, splashing, or spills. Light-weight and economical, disposable garments are available as coveralls, shirts and pants, head-covers, and aprons, and are available from safety supply companies.

REFERENCES

Ontario Pesticides Act, 1973 and Regulation 618/74

Section 40 (a) (i) and (ii)
" 42 (1) (i)
" 43 (a) (ii) and (b) (iv)
" 51 (a)
" 57 (b)
" 65 (2) (i) and (ii)
" 100 (2) (b) (i) (ii) (iii) (iv)
" 102 (2) (c) (i) (ii) (iii) (iv)

Appendix I

DISTRIBUTION OUTLETS ACROSS ONTARIO

AOCO Limited - (American Optical - Safety Products Div.)

LOCATION	ADDRESS	TELEPHONE	TELEX
Belleville	P.O. Box 5500, 161 Bridge Street West,	(613) 962-2553	-
Cornwall	236 Pitt Street, P.O. Box 369, K6H 5T1	(613) 932-3546	-
Hamilton	36 James Street South, Piggot Bldg., P.O. Box 51, L8N 3A2.	(416) 529-8159	-
London	186 King Street, P.O. Box 2454, Postal Stn. "A", N6A 4G3	(519) 432-8361	-
Ottawa	227 Laurier Avenue West, P.O. Box 410, K1P 5J7	(613) 232-3509	-
North Bay	121 Main Street East, P.O. Box 690, P1B 8J8	(705) 472-8450	-
Peterborough	316 Charlotte Street, P.O. Box 715, K9J 6Z8	(705) 743-3361	-
St. Catharines	195 King Street, P.O. Box 223, L2R 6S4.	(416) 685-8811	-
Sudbury	4 Elgin Street South, P.O. Box 548, P3E 4P8	(705) 675-7472	-
Toronto	62 Overlea Blvd., Thorncliffe Park, P.O. Box 130, Station "R", M4H 1C4	(416) 421-4472 (416) 421-8033	02-21268
Windsor	635 Ouellette Avenue, Liddy Bldg., P.O. Box 221, N9A 6K1	(519) 253-0923	

Levitt-Safety Ltd.

Location	Address	Telephone	Telex
Toronto	33 Laird Dr.	(416)425-8700	06-22286
Cornwall			
Hamilton	1443 Main St. E.	(416)544-5747-48	021-8335
Kitchener			
London	1072 Dundas St.	(519)451-3010	
Orillia			
Ottawa	17-3 Grenfill Cres.	(613)825-3779	053-3540
Sarnia	515 Vida St. S.	(519)336-8530-1	024-76163
St. Catharines	240 Bunting Rd.		

Safety Supply Co. Ltd.

Location	Address	Telephone	Telex
Toronto	214 King St. E. M5A 1JB	(416)364-3234	02-29167
Hamilton	190 Barton St. E. L8H 2V1	(416)547-1019	
Ottawa	1060 Belfast Rd. K1B 3S3	(613)745-0055	053-4128
St. Catharines	78 Queenston St. L2R 2Z2	(416)688-4860	
Sarnia	623 Vidal St. S. N7T 2V9	(519)344-4289	024-76185
Sudbury	767 Lorne St. S. P3C 4R5	(705)674-5871	027-7585
Thunder Bay	567 Memorial Ave.	(807)344-7381	073-4623
Windsor	1240 Crawford Ave. N8X 2A4	(519)252-2326	024-7799

Mine Safety Appliance Co. of Canada Ltd.

Location	Address	Telephone	Telex
Downsview	148 North Finch Dr.	(416)638-2400	

Safety House of Canada

Location	Address	Telephone	Telex
Toronto	15 Brandon Ave.	(416)534-4223	

Industrial Safety Equipment Co. Ltd. (Safety Boots)

Location	Address	Telephone	Telex
Toronto	9 Meteor Dr.	(416)677-8781	

LA-DC-13307

Appendix II

THE EFFECT OF FACIAL HAIR ON RESPIRATOR PERFORMANCE

by

Edwin C. Hyatt, John A. Pritchard,

Charles P. Richards, and Louis A. Geoffrion

PREPRINT FROM

los alamos
scientific laboratory
of the University of California
LOS ALAMOS, NEW MEXICO 87544

UNITED STATES
ATOMIC ENERGY COMMISSION
CONTRACT W-7405-ENG. 36

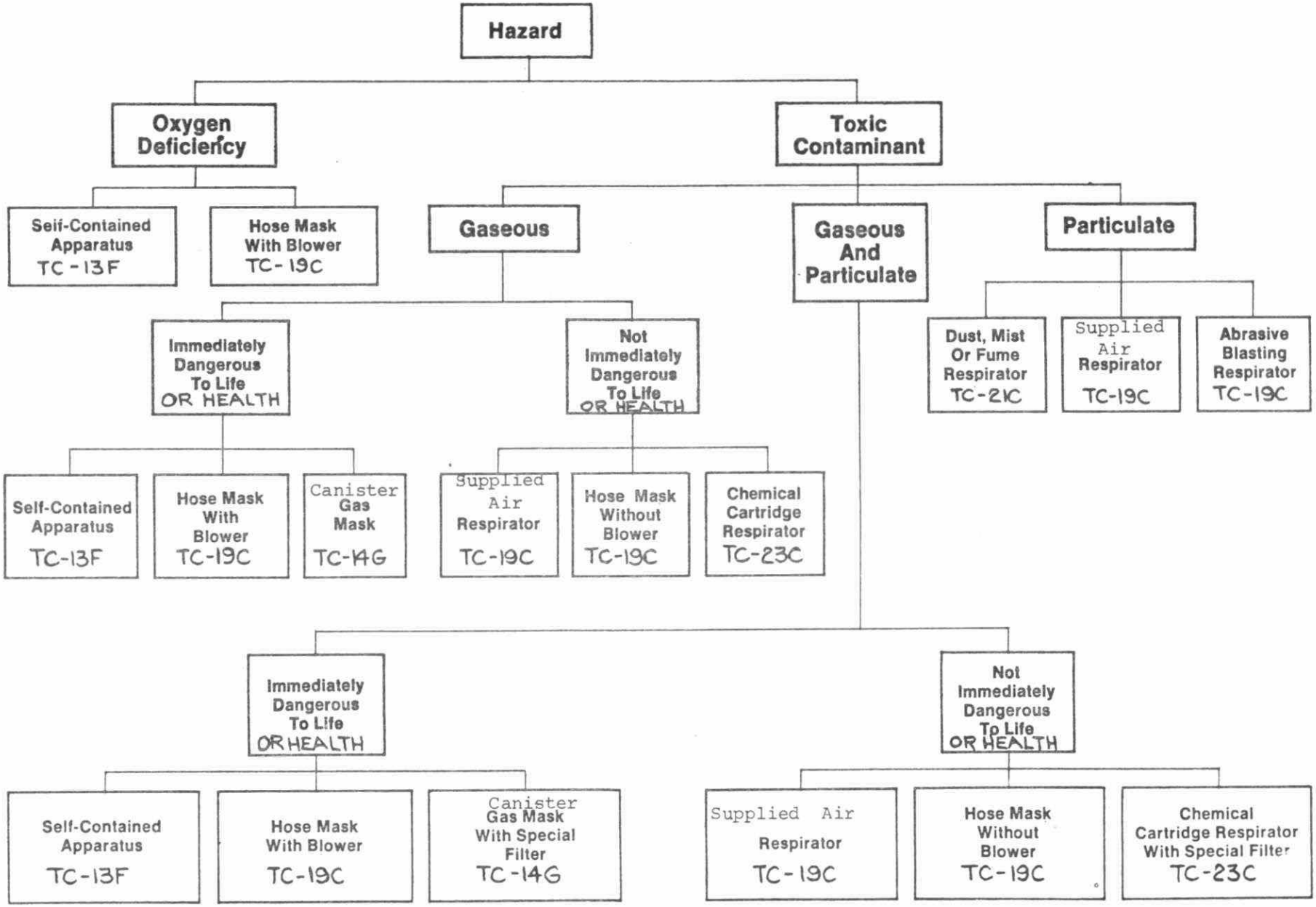
ABSTRACT

It is obvious to the casual observer that changes in the style of men's hair have taken place resulting in long sideburns and beards being worn by numerous men. It is apparent that facial hair may interfere to some degree with the sealing of a respirator facepiece on the face.

The effect of facial hair on the performance of half-mask and full-facepiece respirators was measured with quantitative aerosol respirator-man-test systems. Different test subjects having varying degrees of facial stubble, sideburns, and beards were used in the study.

Test results showed that the effect of facial hair on the performance of a respirator depends upon the degree to which the hair interferes with the sealing surface of the respirator, the physical characteristics of the facial hair, the type respirator worn in relation to the subject's facial characteristics, and other factors.

It is concluded that persons with excessive facial hair such as facial stubble, sideburns, and beards which interfere with the respirator seal, cannot expect to obtain as high a degree of respirator performance as persons who are clean shaven.


Hazard
Oxygen Deficiency
Toxic Contaminant
Self-Contained Apparatus TC-13F
Hose Mask With Blower TC-19C
Gaseous
Gaseous And Particulate
Particulate
Immediately Dangerous To Life OR HEALTH
Not Immediately Dangerous To Life OR HEALTH
Dust, Mist Or Fume Respirator TC-21C
Supplied Air Respirator TC-19C
Abrasive Blasting Respirator TC-19C
Self-Contained Apparatus TC-13F
Hose Mask With Blower TC-19C
Canister Gas Mask TC-14G
Supplied Air Respirator TC-19C
Hose Mask Without Blower TC-19C
Chemical Cartridge Respirator TC-23C
Immediately Dangerous To Life OR HEALTH
Not Immediately Dangerous To Life OR HEALTH
Self-Contained Apparatus TC-13F
Hose Mask With Blower TC-19C
Canister Gas Mask With Special Filter TC-14G
Supplied Air Respirator TC-19C
Hose Mask Without Blower TC-19C
Chemical Cartridge Respirator With Special Filter TC-23C

Outline for selecting respiratory protective devices.

CSA STANDARD Z180.1–1973

0105-Y

PURITY OF COMPRESSED AIR FOR BREATHING PURPOSES

CANADIAN STANDARDS ASSOCIATION

PRINTED IN CANADA

$2.25

TABLE 1

AVERAGE COMPOSITION OF NATURAL CONSTITUENTS OF THE LOWER ATMOSPHERE

Gas Component	Composition Per Cent by Volume	Parts per Million by Volume
Nitrogen	78.09	—
Oxygen	20.95	—
Argon	0.93	—
Carbon Dioxide	0.03	—
Neon	—	18.0
Helium	—	5.2
Methane	—	2.2
Krypton	—	1.0
Nitrous Oxide	—	1.0
Hydrogen	—	0.5
Xenon	—	0.08

TABLE 2

MAXIMUM ALLOWABLE CONTAMINATION

Component	Limit
Carbon Dioxide	400 ppm ± 25 ppm, by volume
Carbon Monoxide	5.0 ppm, by volume
Total volatile hydrocarbons	10.0 ppm, by volume
Moisture (Compressed air for General Use)	Saturated
Moisture, in Dry Compressed Air (See Note)	0.02 milligrams/litre
Odour	Free from objectionable odours
Particulates including oil Environments up to 2 Atmospheres gauge pressure	5 milligrams /cubic metre
Particulates including oil Environments above 2 Atmospheres gauge pressure	1 milligram/cubic metre

NOTE: *The provision for dry air applies to self-contained breathing equipment when used at temperatures below 20°F. A water content of 0.02 mg/litre corresponds approximately to a dew point of −70°F ± 5°F.*

Appendix V

Table 1
Color Assigned to Canister or Cartridge

Atmospheric Contaminant(s) to Be Protected Against	Color Assigned	ISCC-NBS Centroid Color Number	ISCC-NBS Centroid Color Name
Acid gases	White	263	White
Organic vapors	Black	267	Black
Ammonia gas	Green	139	Vivid green
Carbon monoxide gas	Blue	178	Strong blue
Acid gases and organic vapors	Yellow	82	Vivid yellow
Acid gases, ammonia, and organic vapors	Brown	75	Deep yellow brown
Acid gases, ammonia, carbon monoxide, and organic vapors	Red	11	Vivid red
Other vapors and gases not listed above	Olive	106	Light olive
Radioactive materials (except tritium and noble gases)	Purple	218	Strong purple
Dusts, fumes, and mists (other than radioactive materials)	Orange	48	Vivid orange

NOTES:
(1) A purple (ISCC-NBS Centroid Number 218) stripe shall be used to identify radioactive materials in combination with any vapor or gas.
(2) An orange (ISCC-NBS Centroid Number 48) stripe shall be used to identify dusts, fumes, and mists in combination with any vapor or gas.
(3) Where labels only are colored to conform with this table, the canister or cartridge body shall be gray (ISCC-NBS Centroid Number 265), or a metal canister or cartridge body may be left in its natural metallic color.
(4) The user shall refer to the wording of the label to determine the type and degree of protection the canister or cartridge will afford.

6. Labels

6.1 On each air-purifying respirator canister and cartridge, the following shall appear in bold letters:

CANISTER FOR _____
(Name of atmospheric contaminant)

or

CARTRIDGE FOR _____
(Name of atmospheric contaminant)

In addition, either or both of statements (a) and (b), and statement (c), shall appear beneath the appropriate phrase on the canister or cartridge label.

(a) **For respiratory protection in atmospheres containing not more than** _____ **by volume of**
(Concentration)

_____
(Name of atmospheric contaminant)

(b) **For respiratory protection in atmospheres containing**

_____
(Type of particulate contaminant)

(c) **Do not use in atmospheres containing less than 19.5% oxygen by volume at sea level.**

6.2 The information given in 6.1 shall be permanently attached or imprinted on the canister or cartridge.

6.3 The markings specified in 6.1 shall be placed on the most conspicuous surface of the canister or cartridge.

7. Colors

7.1 Each respirator canister or cartridge, or canister or cartridge label, shall be a distinctive color as indicated in Table 1.

7.2 All colors used shall conform to ISCC-NBS Centroid Color Designations listed in ISCC-NBS Color-Name Charts Illustrated with Centroid Colors, NBS Standard Sample No. 2016 [2].

7.3 Where labels only are colored to conform with this standard, the canister or cartridge body shall be gray (ISCC-NBS Centroid Number 265, ISCC-NBS Color Name Medium Gray), or a metal canister or cartridge body may be left in its natural metallic color.

7.4 The color coating or colored material used shall offer a high degree of resistance to changes such as chipping, scaling, peeling, blistering, and fading, and to the effects of ordinary atmospheres to which they may be exposed under normal conditions of storage and use.

REPRODUCED WITH THE PERMISSION OF THE AMERICAN NATIONAL STANDARDS INSTITUTE, INC.

Appendix VI

APPROVED RESPIRATORY DEVICES FOR PROTECTION AGAINST PESTICIDES

1. DUST, FUME AND MIST RESPIRATORS

a) U.S. Bureau of Mines or U.S.D.A. approved: Nil

b) N.I.O.S.H. approved (Code TC-21-C) : Nil

2. CHEMICAL CARTRIDGE RESPIRATORS (DUAL CARTRIDGE)

a) U.S. Bureau of Mines or U.S.D.A. approved (expiry date March 31, 1976):

Approved By	Issued To	Respirator #	Suggested Use
U.S.D.A.	American Optical	R5058 with R58 Filter-Absorbent Cartridge	Recommended for outdoor use against light concentration of pesticides
U.S.D.A.	Glendale Optical	GR2025 and GR4025 with C-25 Cartridge and F-30 Pre-filter	"
U.S.D.A.	M.S.A.	Cushion Comfo #93938 with #93939 GMP Filter Cartridge	"
U.S.D.A.	Welsh	Protex 7549 with 7500-21 Cartridges and 7500-23 Filters	"
U.S.D.A.	Willson	Agri-Tox 2 with R28 Cartridges and R15 Filters	"

b) N.I.O.S.H. approved (Code TC-23-C):

Approval Issued To	Date	Approval #	Respirator #	Use
M.S.A.	3/74	TC-23C-45	459520 with 459519 Cartridges	Recommended for outdoor use against concentration of pesticides
Willson	1/74	TC-23C-54	Agri-Tox 2 with R21 Cartridges and R15 Filters	"

3. CANISTER GAS MASKS

a) U.S. Bureau of Mines or U.S.D.A. approved (expiry date March 31, 1977):

Approved By	Issued To	Canister	Suggested Use
B of M	M.S.A.	GMP Chin Style #88180 approx. 340 cc	Protection against organic vapours of less than 0.5% by volume concentration
		GMP Industrial #88181 approx. 750 cc	Protection against organic vapours of less than 2% by volume concentration, including HCN and methyl bromide
B of M	Welsh	MW7800-7M 750 cc	Protection against HCN in concentrations of less than 2% by volume concentration
	Willson	MH3FC 500 cc	Protection against organo phosphate and chlorinated hydro carbon insecticides

b) N.I.O.S.H. approved:

No approvals to date (Code TC-14-G)

The interchanging of component parts obtained from different manufacturers could seriously reduce the effectiveness of respiratory devices, and would render approvals null and void.

Appendix VII

GAS DETECTOR PUMPS

MAKE	TYPE	MANUFACTURER	CANADIAN DISTRIBUTOR
Drager	Bellows	Dragerverk	Safety Supply Co., Toronto, Ont.
Gastec	Piston	Gastec	Levitt-Safety Ltd., Toronto, Ont.
Kitagawa	Piston	Kitagawa	Matheson of Can. Ltd., Whitby, Ont.
M.S.A.	Piston	Mine Safety Appliance Co.	M.S.A. Canada, Downsview, Ont.

GAS DETECTOR TUBE UNITS PRESENTLY AVAILABLE

(NOT YET CERTIFIED BY NIOSH)

A) METHYL BROMIDE TLV = 15 ppm

MAKE	TUBE NUMBER	RANGE
Drager	CH27301	5-50 ppm
Gastec	IL-136	10-100 ppm
Kitagawa	8014-157	10-500 ppm
MSA-Universal	85834	10-100 ppm

B) HYDROCYANIC ACID GAS TLV = 10 ppm

MAKE	TUBE NUMBER	RANGE
Drager	CH25701	2-30 ppm
Gastec	IL-12L	5-60 ppm
MSA-Universal	93262	1-65 ppm

C) PHOSPHINE TLV = 0.3 ppm

MAKE	TUBE NUMBER	RANGE
Drager	CH31101	0.1-4 ppm
MSA-Universal	81101	0.025-1 ppm

February 1975

Appendix VIII

GLOVE COMPARISON RATING CHART

Substances	GLOVE COMPOSITION			
	P V C	Neoprene	Rubber	Hycron
Mineral Oils and Acids	Not Recommended	Superior	Good	-
Petroleum Solvents	Good	Superior	Fair	-
Alcohols	Good	Superior	Good	Superior
Aromatics	Fair	Superior	-	-
Organic Acids	Fair	Superior	-	-
Formaldehyde	Good	Superior	-	-

T
55.5
.P4
057
1975